Hungry Ridge Project Site Visit

Forest Health Protection, Coeur d'Alene Field Office, Functional Assistance

CFO-TR-13-020

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Agency/Unit: U.S.D.A. Forest Service, Nez Perce and Clearwater National Forests, Salmon River Ranger District.

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Others Present: Sue Harries, Forester, Silviculture, Salmon River Ranger District; Joanne Bonn, Wildlife Biologist, Salmon River Ranger District; Tim Theisen, Fuels Specialist and AFMO, Clearwater Ranger District, 208-983-4039.

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Project Area: Hungry Ridge Project

Location: Project contains National Forest Service stands within the Nez Perce and Clearwater National Forests, Salmon River Ranger District bounded on the north by the South Fork Clearwater River, on the west by Mill Creek, on the east by John's Creek, and on the south largely by the Gospel Hump Wilderness and NF-444 and NF-444A.

Size (acres): Project boundary includes 35M acres per Forest staff; not all areas within the project boundary will be proposed for treatment.

Project Objectives: Primary objective of this project is to reduce fire hazard and modify large fire behavior at a landscape or watershed level. Secondary objectives will include regeneration of less susceptible species in areas of root disease. Methods being proposed may include mechanical thinning in stands that are dry to moist that are predominately grand fir (GF) and other stands that are heavy to western larch (WL). There are dry older-growth stands that are Douglas-fir (DF) or ponderosa pine (PP) / WL that are proposed for thinning from below. Some stands may qualify for "MA20" designation as old growth, and may be of interest for conservation. There may also be opportunities to burn some areas within the project boundary at landscape level. Forest staff took us to areas that may be representative of those chosen for thinning.

Primary Forest/Cover Type(s) by decreasing prevalence: Stands we observed were mostly dry GF and some moderate GF sites. Species were primarily GF, DF, PP, and lodgepole pine (LP), with some WL. Young subalpine fir (SAF) was present at some sites.

Primary Damage Agents Observed – Tree Species Affected:

1) Root disease complex: Armillaria root disease (*Armillaria* sp.) – DF, GF; suspected fir-type Heterobasidion root disease (*Heterobasidion occidentale*; "annosus root disease") – DF, GF; and laminated root disease (*Phellinus sulphurascens*) –GF, (likely also DF).
2) Douglas-fir beetle (DFB) (*Dendroctonus pseudotsugae*) and associated pouch fungus sap rot (*Cryptoporus volvatus*) – DF.
3) Fir engraver beetle (FEB) (*Scolytus ventralis*) – GF.
4) Fir broom rust (*Melampsorella caryophyllacearum*) – GF.
5) Larch dwarf mistletoe (*Arceuthobium laricis*) – WL.
6) Mountain pine beetle (MPB) (*Dendroctonus ponderosae*) – LP.
7) Indian paint fungus (*Echinodontium tinctorium*) – GF.
8) Balsam woolly adelgid (BWA) (*Adelges piceae*) – SAF.
9) Bear damage – LP.

Site 1: T29N R4E Section 36 NW, BM. Waypoints 45.809682° -115.901547°, 45.812682° -115.907497° were near the path provided by non-motorized-access road NF-9427, which had been reached from the NF-309 road.

Primary Forest/Cover Type(s) by decreasing prevalence: GF/PP mix, with some DF.

Other Pertinent Site Information: This was a dry site with legacy GF. BA was 140-180, average 160 but over 200 in some spots per Forest staff. GF/DF was regenerating in areas of denser canopy, but areas that were more open showed PP regeneration. Site 1 was at the edge of a unit proposed for regeneration harvest.

Observations:

There were many dead GFs, of which some were in small pockets; other GFs had fading foliage as well as irregular dead branches interspersed in crown; yet others had dead tops presumed to include attacks by FEB. An amount of light coming through the crowns of some GFs and DFs and the large portion of the boles that was visible through the living crown was evidence of thin crowns. Many spots near the first waypoint of Site 1 had DFs with thin crowns, bent leaders, foliage that was fading green or orange, or that were dead. All symptoms indicate a root disease complex on Site 1 causing growth loss and predisposing trees to mortality.

Root disease mortality could not be ascribed to specific root disease agents at Site 1. Had they been present, wind-thrown trees would have provided the best means of examining entire root systems to locate which roots were diseased and by which pathogens, but such tip-outs were not accessible at this site. This limited us to examining standing recently dead trees or trees with symptoms of decline by scraping soil away from root crowns and roots near the surface, and then looking for signs and symptoms characteristic for different root disease pathogens such as external ectotrophic hyphae, internal mycelial fans, and types of decay. Our inability to identify the specific pathogens is consistent with standing GFs on drier sites having fir-type annosus root disease. This disease is most prevalent in inaccessible central roots, while accessible surface roots at the root crown can be unaffected. When present, Armillaria root disease is more easily detected in root crowns than annosus root disease (for

example, at Site 2), but Armillaria root disease if usually less of a problem on dry GF sites such as Site 1. The other disease present at Site 1 (Fir broom rust on some GFs) was considered insignificant.

Patterns of mortality from aerial imagery and Aerial Detection Survey (ADS) was that expected for stands with root disease but no full scale bark beetle outbreak. Examination of color aerial imagery from the four dates available for this site from Google Earth from 06/2004, 08/2009, 12/2011, and 7/2013 showed a pattern of sustained scattered mortality (scattered trees still retaining orange foliage) over a widespread area in recent years, and that this mortality has continued at the same or an increasing pace. This mortality was presumed to be occurring in DF/GF, as observed on the ground. The 2013 Nez Perce Reporting Area, Elk City Aerial Detection Survey (ADS) map showed this site and vicinity to have relatively little insect activity. One polygon of approximately five trees killed, attributed to Douglas-fir beetle, was the only notable activity identified. Scattered mortality observed on the ground was typical of that associated with endemic populations of DFB, MPB, and FEB.

The stand at the second waypoint of Site 1 provided us an example of the desired condition, and was of 80% PP and 20% DF. A PP had tipped out here, but had mostly sound roots and some brown cubical rot. It did not appear to be affected by P-type annosus, which is the predominant root disease of concern in pines. Most likely, it had blown over in high winds while green due in part to increased wind exposure after thinning. Root disease was not suspected in the PP at that time and location.

Site 2: T28N R4E Section 23, BM. Waypoints were 45.748373° -115.918651° and 45.746544° -115.920096° near the NF-1862 road.

Primary Forest/Cover Type(s) by decreasing prevalence: This was a moderate-to-dry GF site. Trees were mostly GF, DF, LP, and PP, with some large WL.

Other Pertinent Site Information: BA was 240-250 per Forest staff. Typical fire return interval would be 50 years per Forest staff, but this stand has missed one or more fire returns. Waypoints straddled the edge of a previously accomplished Intermediate Harvest vegetation treatment unit, according to the map Forest staff provided 8/31/2013. The first waypoint was in an area with the previous management; the second waypoint was in a proposed treatment area. Forest staff were considering retaining legacy trees (22" DBH and above) and removing ingrowth including GFs and DFs, but leaving WLs even when infected with larch dwarf mistletoe.

Observations:

Root disease was a driving force in this mixed-age stand. Mortality is ongoing. Armillaria root disease was found in DF and GF at both waypoints, and laminated root disease in a GF stump at the first waypoint. Annosus root disease may be present but not detected, for the same reason indicated under Site 1. There were many stems of extremely variable diameters lying crisscrossed on the ground at the second waypoint. Although the stand was fully stocked at the time of the visit, at least 50% of the original canopy had previously been lost from root disease, so the untreated stand rated a root disease severity class 5 in Hagel's severity scale. When based on stems on the ground, it ranked a severity class 7. The combined reading was 6. Any rank above 5 means a stand has high root disease severity.

Also, some of the large GFs had very large Indian paint fungus conks, indicating extensive columns of decay with only a rind of sound wood.

Examination of color aerial imagery from the four dates available for this site from Google Earth from 06/2004, 08/2009, 12/2011, and 7/2013 showed a pattern of scattered recent mortality (trees retaining orange foliage) over a widespread area, and that the rate of mortality was stable, typical of mortality endemic bark beetles with root disease an underlying predisposing factor for the beetle-associated mortality. Mortality appeared to be at a somewhat lower level than at site 1. The mortality in the aerial photography was presumed to be occurring in DF/GF, as was observed on the ground.

As at Site 1, the 2013 Nez Perce Reporting Area, Elk City ADS map showed this site and vicinity to have relatively little notable insect activity. Several polygons of approximately two to ten trees were recorded, with mortality attributed in the ADS survey to DFB, MPB, and FEB. Otherwise, typical scattered mortality associated with endemic populations of these beetles was observed on the ground.

Mistletoe was common in the large WL. The big pines had only 1-2 years of needles, which could indicate stress.

Site 3: T27N R4E Section 8, BM. Waypoint was 45.693620° -115.983369° near the NF-9412 road.

Primary Forest/Cover Type(s) by decreasing prevalence: GF, DF, PP, LP, understory Rocky Mountain maple (RM) and subalpine fir (SAF).

Other Pertinent Site Information: Largest legacy trees were PP and DF. Living crowns for LP were high in canopy, without lower living branches to support growth.

Observations:

Pole-sized LPs were being killed by mountain pine beetle. The few large DFs and PPs looked healthy, with no fading or downed trees. The only tipped-over trees were LP killed by MPB, and these had no evidence of the common root diseases of LP, p-type annosus root disease and tomentosus root disease. There were large numbers of very young GFs and some SAFs. Understory SAFs with about 3" DBH were being killed by BWA. Gouting symptoms were seen on small branches. Indian paint fungus conks were observed in large GFs, and some of these large trees appeared to have topped-out growth, possibly from root disease, but there were no root crown indications of the root disease pathogens in GFs examined at this site. Lack of detection could be due to our inability to access fungus-colonized parts of the root system for some root pathogens, as described for Site 1; annosus root disease was suspected.

Examination of color aerial imagery from Google Earth documented the progress of an MPB outbreak. There appeared to be no mortality in the stand in the 08/2009 imagery, minor scattered mortality on 12/2011, and patches of concentrated mortality in 7/2013, mostly in the larger tree class. The patches were especially heavy ~0.1 mile SE, S and W of the waypoint. This outbreak was also documented on the 2013 Nez Perce Reporting Area, Elk City ADS map, which had numerous polygons of MPB- infested lodgepole pine in the vicinity of Site 3. The pattern of mortality was unlikely to be the result of root disease.

Special Issues or Concerns:

The sites visited were offered as typical of stands in the Hungry Ridge Project being considered for management that included tree removal as a part of the management. The main forest health issues we identified in these stands were high basal areas conducive to bark beetle epidemics and continued infection and mortality from root diseases. For the Forest's management objectives, these forest health issues will affect stand productivity, composition, and canopy characteristics. This is critical for understanding levels, connectivity, and burn characteristics of ground, crown, and ladder fuels and their change over time with different management choices. If no management is done, these and similar stands in the project can be expected to have the following outcomes:

- Areas with current high basal areas of DF, GF, and LP would likely remain vulnerable to attack by bark beetles due to tree age, inter-tree competition, and disease. Under environmental stress, outbreaks could occur that would accelerate mortality from that currently being seen.
- At all sites, current forest conditions of over-maturity and overcrowding have set the stage for bark beetle infestations in GF, DF, and LP. At site 3, MPB populations have been steadily increasing over the last several years. This trend could continue, as well as the possibility of MPB increases across the remaining planning area. Pockets of DFB infestations are also shown to be increasing across the planning area as well.
- Even without full-scale bark beetle outbreaks, expect that portions of stands and units with high concentrations of Douglas-fir and grand fir will experience continued and increasing mortality from root disease. Root disease will persist in affected stands; the pathogenic fungi that cause root disease survive for decades in stumps and roots of dead and dying trees, and will continue to cause infections and to intensify and cause mortality in susceptible species.
- Small canopy gaps caused by root-disease mortality will favor shade tolerant species, notably GF and DF, but not shade-intolerant species such as pines and western larch that are less susceptible to root disease. This will create or perpetuate a multi-aged canopy of mostly root-disease susceptible species on many stands. Alternatively, brush fields may develop, as brush is also resistant to root diseases present in these stands.
- The susceptible conifers that regenerate on sites with well-established root disease can be expected to die at many ages, not just as mature trees. The expected result is a mixture of living and dead trees of mixed sizes (ladder fuels) that must be considered for landscape-level fire planning.
- Partial harvest entries on sites with active root disease which leave mostly susceptible species will in most cases accelerate root disease infections and losses in remnant trees of susceptible species. Such harvests will not restore productivity; productivity and basal area are likely to decline over time.

Recommendations:

- Forest may consider thinning stands to lower BAs to reduce moisture stress, reduce competition, and make stands less conducive to bark beetle epidemics in some cases:
    - Thinning should mostly leave trees of species (WL, PP, LP, and on wet sites, western red cedar and western hemlock) less susceptible to locally important root disease.

    - If LP and WL are left as long-term overstory, it is preferable that they do not have low green crown to total height ratio, as "leggy" trees in these species have difficulty supporting cambium of trunk and roots and may be more subject to mortality, breaking, lodging, or in the case of LP, MPB attack.
- Thinning is generally not recommended for stands with root disease that do not meet the above suggestions. Losses to remaining trees will accelerate, especially in mesic to wet stands where Armillaria is present. Some reports show over 50% of susceptible leave trees dying of root disease in such stands. Evidence from thinning grand fir on dry sites has less documentation. In young GF sites with annosus root disease, precommercial thinning improves growth and survival. Thinning and harvest operations in mature GF causes stem and root wounding that allows new infections, and stable "inactive" infections can also become aggressive to kill trees.
- Forest might want to consider regeneration harvests, with or without leave trees, in many stands with moderate to severe root disease (Hagle classes 3 and above). Thinning would not be appropriate in these stands, and delaying regeneration will result in ongoing mortality and potential for bark beetle outbreaks.
- Forest may want to consider delaying regeneration in stands with low levels of mortality from root diseases (Hagle classes 2 or lower), to allow further growth. Entries in such stands would accelerate root disease in remaining root-disease susceptible trees.
- Wherever regeneration of WL is planned under thinned or remnant WL (e.g., Site 2), Forest staff should recognize and plan for leave tree mortality and infection of understory from dwarf mistletoe (DM). DM severity of overstory trees will increase about one Hawksworth DM severity class a decade, and succumb within a decade of reaching DM6 (trees with >50% of branches infected in each third of the living crown). If a goal is to prevent regenerating WL from becoming infected, it is recommended that DM infected overstory be removed or girdled (for example, to create a persistent snag) within 7 years of seedling establishment.

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